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MEDICAL NEWS LETTER

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Policy

The U. S. Navy Medical News Letter is basically an official Medical Department publication inviting the attention of officers of the Medical Department of the Regular Navy and Naval Reserve to timely up-to-date items of official and professional interest relative to medicine, dentistry, and allied sciences. The amount of information used is only that necessary to inform adequately officers of the Medical Department of the existence and source of such information. The items used are neither intended to be, nor are they, susceptible to use by any officer as a substitute for any item or article in its original form. All readers of the News Letter are urged to obtain the original of those items of particular interest to the individual.

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Please forward changes of address for the News Letter to: Commanding Officer, U. S. Naval Medical School, National Naval Medical Center, Bethesda, Maryland 20014, giving full name, rank, corps, and old and new addresses.

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Mosquito-Borne Epidemic Hemorrhagic Syndromes *

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The first major outbreak of the hemorrhagic fever syndrome occurred in Manila in 1956. Characterized by hemorrhage and fever, the disease caused 750 hospitalized cases; the mortality rate was 10%. Two years later, a similar disease occurred in Bangkok and recurred in 1960 and 1962. In Singapore, in 1960, another hemorrhagic fever outbreak was observed, although the disease differed. Other hemorrhagic fever syndromes have been reported during the last 20 years. They have been divided into six groups depending upon geographic distribution and upon the vectors involved: First, the hemorrhagic fever with renal syndrome seen in Korea, and thought to be mite-borne. Second, The Argentine hemorrhagic fevers, then the tick-borne group, including Southern Soviet hemorrhagic fevers, Russian Spring-Summer encephalitis. Next the mosquito-borne dengue group, and last, yellow fever.

Three epidemics of hemorrhagic fever have occurred in Bangkok in 1958, 1960, and 1962 involving, respectively, 2000, 2000, and 4000 cases. The original mortality rate of 10% has, by prompt hospitalization of affected persons, been reduced to 5%. Since knowledge of the disease is based on hospital cases, the total spectrum of the disease is unknown. The epidemics begin in May, reach a peak in July and August, then gradually decline, and disappear in November. This pattern corresponds with the monsoon season when mosquitoes are most prevalent. Yet the disease is urban. Urban mosquitoes in the area are Aedes aegypti and Culex fatigans; the prevalence of Aedes is independent of external rainfall. Another interesting feature of the disease is its age-specific distribution; it has not been described in persons over 14 years; the modal age is 3 or 4 years. Perhaps only children show severe manifestations, although all persons are affected. It may be that adults have been immunized by dengue 12 to 14 years earlier. This is not known. The disease is a problem only in urban areas, and factors of race and sex have not proved to be significant.

Clinically, the disease may involve a child, usually Chinese or Thai, 3 or 4 years old. On the first day, fever, cough, headache, vomiting, or abdominal pain may occur, but the child does not appear seriously ill and is usually still eating and ambulatory. Two days later, the child is definitely ill, anorexic, not walking around, weak, and restless. The face is flushed;

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there is conjunctival injection. Hepatomegaly and the first peripheral petechiae may be observed. A tourniquet test done at this stage would be positive. Petechiae occur in 70% and hepatomegaly in 60% of all cases. On the fourth day, shock supervenes in 10% of cases. The mechanism is unknown, although it does not appear to be adrenal in origin. Other hemorrhagic phenomena become manifest, more petechiae, purpura, epistaxis, hematemesis, and melena. On the fifth day, half of the patients are in shock; 5% of those affected by the disease, die. The remainder rapidly recover leaving the hospital on the 7th or 8th day. There are no sequelae.

Laboratory data are not helpful. Thrombocytopenia is seen, but leukopenia or leukocytosis is variable. Turk cells may be present in blood smears. Hemoconcentration is hard to evaluate because the child takes little fluid. Bone marrow aspirates show adequate numbers of megakaryocytes with maturation arrest. Some cases have bronchopneumonia, some, abnormal liver function. At postmortem, gross petechial hemorrhages are seen in all organs. Serous effusion occurs into pericardial and abdominal spaces. Also observed have been interstitial pneumonia, granulomatous lesions in the spleen, and fatty degeneration in the liver.

Treatment is entirely symptomatic. After observation of hemorrhage, fever, hepatomegaly, and shock, diagnostic measures include isolation of the virus and serologic studies. Virus isolation must be accomplished within the first 3 or 4 days of illness. It is a long arduous process, not employable as a routine measure. Serologic technics are available but identification of the causative organism is complicated by cross-reactions with other dengue viruses—1, 2, 3, or 4.

The etiology of hemorrhagic fevers has not been definitely established. More than half the isolations from ill patients have shown dengue viruses. Formerly thought to consist only of types 1 and 2, the dengue group has been shown recently to contain types 3 and 4, or even 5 and 6. A large number of isolations have grown Chikungunya virus from group A arthropod-borne viruses. From Aedes mosquitoes in urban areas, dengue types 2, 3, and 4, as well as Chikungunya have been grown. The last has been isolated once from Culex fatigans. Has a new virus been introduced from outside the area? Have dengue types 1 and 2 undergone kinetic variation and selection with resultant production of more virulent types? Has host susceptibility changed? Have enzootic viruses for some reason slipped over into the human population? Have environmental factors changed, permitting a low rate of human infection to become epidemic?

Control measures should be directed against eradication of Aedes aegypti and protection of patients during the viremic stage of illness, the first 4 days, from mosquitoes.

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Developments in Virology

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A virus is generally thought of as a miasmatic creature which is vaguely threatening. However, there have been marked advances in the ideas of viral morphology. It was found years ago that when one sectioned cells infected by viruses and looked at the particles, the particles were often arranged in peculiar crystalline arrays. It was tempting actually to isolate crystals of multiple virus particles. From this point, investigators progressed to the examination of individual virus particles which were also seen to be constructed along crystalline lines. A variety of crystalline symmetries was seen to prevail. A given particle presumably has on its inside nucleic acid, on the outside, protein; the particle is cleverly constructed along a 5-3-2 series of symmetrical axes. At times, the individual protein units are ball-like, at other times, they seem to be hollow cylinders. Some particles are arranged in peculiar vesicular structures, viz., chickenpox. The general appearance of a virus is thus far removed from the miasmatic creature of the imagination.

By the time a viral disease has actually been recognized, most of what has gone on structurally in the virus particles has already happened. When a patient becomes infected, the virus multiplies in a series of cycles in susceptible cells; there tends to be a stepwise increase in the total viral population of the body. The patient, however, is frequently almost well or virtually well until the nonspecific prodrome occurs. At that time, there is a maximal virus concentration in the body, and the virus is then present in the blood. By the time the doctor sees the patient, things are likely to be over with. In most viral diseases the damage has been done to those cells that are going to be damaged. Therefore, at the time that a physician observes the measles rash, the chickenpox lesion, the common cold, or whatever the specific manifestation, viral multiplication has largely finished. If the physician wishes to make a specific diagnosis, he must get an early grip on the patient and catch the area when there are still lots of viruses present, or one has to rely on the rise of antibody titer which follows the actual viral disease.

Viral recovery should, of course, be mentioned. First, it is necessary to have a clinical impression, the earlier the better. For isolation of viruses, various systems of whole cells must be available, ranging from tissue culture through man. Demonstration of a rise in antibody titer, too, should be attempted. Recovery of a viral agent or demonstration of a rise in antibody titer do not, of course, indicate that this particular agent caused the disease. As an example of diagnosis by these methods, let us consider the case of a small boy with a nasty-looking eczema on the top of which are many vesicular lesions. These might represent a varicelliform eruption; it could be anything, but is most often chickenpox or herpes simplex. Scrapings from the base of a vesicle stained with Giemsa show multinucleated giant cells, a reaction which is suggestive of involvement by DNA viruses. Failure of the virus to grow on

egg membrane suggests chickenpox; growth suggests herpes simplex. The specific neutralizing antibody titer rises later.

In discussing the clinical diagnosis of respiratory viral disease, the clinical examples are considered. Patient A arrived at a ski resort feeling fine. After a day of brisk skiing topped off by a swim, he felt very tired as he crawled from the pool. Next morning, he had a dry throat, felt chilly and had a splitting headache together with vague chest pain. Then began a train of symptoms classically attributed to influenza, frontal and retro-orbital headache, chest pain, generalized aches and pains, particularly deep aches in bones and joints. None of these signs, of course, are specific for influenza; the only specific sign, cited by Dr. Arthur Bloomfield, is lack of cheer. At all events, the disease in patient A pursued its course for several days, ending in fairly abrupt improvement. At this time, in the ski resort there were approximately 350 people with the same disease. It is important to emphasize that only a minority of patients show the full-blown clinical picture. Patient B, a close friend attendant on patient A, had truly minimal signs of infection which would not have been diagnosed had it not been for a subsequent rise in subtype-specific antibody titer. Patient C, another close friend and physician to patient A, had an illness of intermediate severity. Those who are clinically ill are poor spreaders of the disease; they are off in bed, too sick to spit in the vicinity of other persons. Those who are relatively well, however, are very good spreaders of the disease.

Other viral diseases can certainly mimic influenza. Having the "flu" may be taken to mean that the patient has an illness which is bacterial in nature, although infectious, and from which prompt recovery may be anticipated. Another such illness began in the case of a house officer when he noticed, while shaving, a large pre-auricular lymph node. Comcomitant follicular conjunctivitis was observed by a colleague in the Eye Clinic. Next day, he had a sore throat, the day after, a little fever. His eyes began to really hurt. "Typical adenovirus infection" was the diagnosis, confirmed by rises in antibody titers. The point of the presentation is that one serious respiratory infection cannot by clinical means be distinguished from another. Most useful in diagnosis is the associated sign; in adenovirus infection, the eye lesion provides the clue.

The adenovirus group provides an example of how different types of a given brand of virus may give rise to different natural histories and different clinical manifestations. Adenovirus types 1, 2, 5, and 6 cause infections practically always of small children and tend to survive subsequently in lymphoid tissue. Practically every adult now present at this discussion could be shown to have adenovirus residing in the lymphoid tissue. Type 3 is a moderately frequent cause of an infection in older children often called "swimming pool conjunctivitis." Types 4 and 7, for unknown reasons, cause infection only in military personnel. It has not been described in college students of the same age. Specific eye infection, usually in adults, is caused by type 8. Severe systemic illness does not occur, but the eye difficulties may be relatively long-lasting. That multiple types existing in many kinds of different viruses may have relatively distinct patterns of natural behavior, as well as

clinical manifestations, is not impossible to understand when one reflects that many of these viruses affect types of tissue with very limited ability to respond. The syndrome of the common cold, for instance, may be provoked by a vast number of influences, emotional stress, atmospheric irritants, chemical irritants, allergens, and a host of infectious agents. The response of the upper respiratory tract to insults is limited. What can a nose do? It can run or it can stop up!

There have been some new developments in the field of therapy. Despite the human need for treatment of an ailment, prescription of antibiotics or chemotherapeutic agents is of no value. Research is directed toward interruption of the virus cycle of infection. If a virus particle is absorbed onto a cell, it usually injects its nucleic acid or the whole particle enters. Cycles of multiplication then occur. Before the cycle of multiplication can occur, however, the protein and nucleic acid have to become uncoupled; the nucleic acid or the virus particle instructs the synthetic machinery of the cell to make "virus nucleic acid" rather than cellular material. Once this has been done, the virus nucleic acid in some way influences future protein synthesis. If all goes well for the virus particle, these two will be reassembled with the result that fully infectious viral particles may be produced and released from the cell. The cycle may be interrupted by administration of gamma globulin; given at the right time after exposure in the right amount, gamma globulin can suitably coat the virus particles. Such a preventive measure has been used in measles, infectious hepatitis, German measles, questionably in chickenpox, and rarely effectively in poliomyelitis. Coating the virus particle with specific antibody prevents its entry into the cell.

At the next step, spontaneous blocking may occur. Synthesis of new nucleic acids is blocked by a protein that forms in the cell under the influence of active or inactive virus. Called "interferon," this protein has reasonably well defined molecular characteristics. In some way it specifically interferes with the synthesis of new virus. Its development in viral therapy, if properly prepared in large concentrations, is limited by two big problems. One, interferon is host specific, although it acts against all kinds of different viruses; two, its available concentration in lots thus far prepared is extremely low. A third place where active interference, in a treatment sense, with virus diseases might be considered is in the preparation of analogues of the building blocks of nucleic acid. If these analogues are improper, an inactive fraudulent nucleic acid may result that cannot function biologically. The limitation of the method lies in the fact that the nucleic acid of the synthesized viruses is of necessity closely related to the nucleic acids of the whole cell.

Although assumed for many years that this method would not work, it has recently been shown that experimental herpes simplex in the rabbit eye—which produces a large dendritic ulcer—will resolve if the analogue 5-iodo-2-deoxy-imidine is applied topically. Effects of viral multiplication have been interfered with even after the lesion had become established. Human herpetic eye lesions can be suppressed even though the material is given late in the disease. There may be diminished synthesis of new virus, but not total suppression. The answer to treatment of many viral diseases is still forthcoming.

Scrub Typhus

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Since time does not permit discussion of the rickettsioses as a whole, this presentation concerns the distribution of scrub typhus, the sequence of events leading to infected foci, and the course of the disease in the infected person.

Epidemic louse typhus and flea typhus are urban and worldwide in distribution. The various forms of tick typhus, on the other hand, have each evolved locally in some fixed host association. Hence, differently named diseases and different subspecies of tick occur. Scrub typhus differs in being the only tick-borne rickettsiosis geographically restricted to one region, from Japan to Australia. Survey of a regional map showing distribution of this disease reveals blank areas that have not been investigated, areas in which the disease is passing, and regions in which it is endemic. Within these last are very small restricted foci which represent the epidemiologic infective units.

In Japan, for instance, classical scrub typhus transmitted by tsutsugamushi is restricted to one area. In that geographic region there are a number of endemic and a few relatively endemic sub-regions which follow the courses of certain rivers where they debouch onto the plains and are constantly flooding. Within an enlargement of an endemic part, dots appear representing confirmed infected foci. These are called typhus islands.

Abandoned areas of cultivation, whether palm, rubber, or tobacco plantations or simply primitive agriculture, become covered with dense undergrowth affording cover for a large rodent population. This is the beginning of an infected focus. The cycle of infection commences.

Mites, Trombicula akamushi or deliensis, are the vectors which transmit R. tsutsugamushi. Out of its eggs come little 6-legged larvae, chiggers, that normally feed on small rodents and birds. The engorged chigger drops off in 2 or 3 days and becomes a pupa. Out of the pupa comes an adult form of tick which is not parasitic but feeds on soil arthropods. It is sexually immature. Next comes another pupal stage followed by the sexually mature adult form. Fertilization of the female causes her to lay eggs. The larvae which emerge from the eggs may be restricted to very small patches of soil. They may gather on the top of a leaf where they are just visible to the naked eye as little specks of reddish dust. Any animal brushing by this leaf acquires chiggers. Another type—near Tokyo—congregates on small volcanic rocks. The normal animal host is the rat; as many as four hundred chiggers may infest one rat. Man is the incidental host.

Man is seldom exposed to sylvatic or jungle scrub typhus. The causative mites are either scarce or arboreal in the wild. The major vectors belong to a ground-dwelling genus, Leptotrombidium, previously alluded to by the former name Trombicula. Both the akamushi species—distributed from Japan to New Guinea including Malaya—and the deliensis are vigorous

enthusiastic vectors which flourish in wasteland, especially in grassy land. They give rise to the classical disease in the classical terrain at the classical season of warm wet weather. Some purely local species of Leptotrombidium, however, especially in Japan, cause unexpected outbreaks in widely different places. Local subspeciation of rickettsia occurs; recently in Malaya, for example, scrub typhus has been found in coastal sandy areas quite different from the classical environment for transmission of this disease.

The course of the disease in man follows inoculation by an infected chigger. The rickettsiae multiply at the site of biting and rapidly become distributed. A local lesion, a small ulcer with later formation of eschar, occurs and there is an associated rickettsemia. The organisms multiply mostly in the lining of the smaller blood vessels; the organ they settle in and their virulence determine the course of the disease. Classical typhus presents—like early measles—flushed face, conjunctival injection, weeping eyes, a rapidly developed typhoidal state with lack of cheer and intoxication. Then a rash appears; in scrub typhus it involves the trunk. It is small, patchy, maculopapular or macular. A slight amount of rickettsial pneumonia occurs. Cough is characteristic. Cardiac involvement and encephalitis may occur. Laboratory diagnosis by the Weil-Felix reaction is important, but the rise in titer may be late—several weeks after onset. In some epidemics, the reaction has been consistently negative.

Standard treatment with tetracycline or chloroamphenicol must be pursued if started at the very beginning of illness or relapse may occur. Long continued small doses are recommended. In a desperately ill patient well into the second week of illness, even one large dose, especially if combined with corticosteroid, may be effective.

Control of scrub typhus may involve personal prophylaxis by impregnation of clothing with mite repellents, dimethyl or dibutyl phthalate, benzyl benzoate or area control. The Japanese are trying a polyvalent vaccine. Drug prophylaxis is not advised. Area control may be achieved by chemical sprays. An area repeatedly causing trouble may be bulldozed and placed under cultivation. Rat control should never constitute the initial step; if rats are removed from an infected focus, the chiggers will feed on human beings. Following area control by chemicals, rat control should be carried out.

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Rabies - Problems and Progress

Orlando A. Soave D V M, Assistant Professor of Preventive Medicine, Stanford University School of Medicine.

Rabies is a disease that affects all mammals including man. It is caused by a relatively large virus which is usually shed in the saliva of infected animals and transmitted by the act of biting. The disease has been recognized for at least 2500 years. Democritus, in 500 B. C., and Aristotle in the Fourth Century B. C., gave excellent clinical descriptions. In the first Century A. D.,

Celsus recognized the relationship of rabies in animals to hydrophobia in man and recommended cauterization of wounds. Since these early descriptions, the disease has been reported in all parts of the world except Australia and the Hawaiian Islands. The absence of rabies in these areas is not as yet explained. Some observers believe that, possibly, it is because certain species of maintaining reservoirs, such as Mustalidae and Viverridae, the skunk and weasel families, are absent from these areas. In the United States during 1961, the disease in animals was reported in 39 States, and in 1962, 3 more States reported it. About 3500 animal infections were reported in 1961, involving—in addition to wild animals—dogs, cats, cattle, and horses.

From the site of the wound, the rabies virus gains entry to the central nervous system, ostensibly via the nerve tracts. Viremia has not definitely been shown. Once the virus reaches the central nervous system it produces an encephalitis. Neuronal degeneration, neuronophagia, gliosis, perivascular cuffing, and cerebral edema occur. Intracytoplasmic inclusion bodies, Negri bodies, appear within the neurones as magenta-staining spots which, in turn, contain basophilic granules. Demonstration of the inclusion bodies is diagnostic.

Although rabies continues to receive tremendous publicity, the incidence of the disease in dogs and domestic animals has been declining for 10 years, during which time fewer than 10 human fatalities have occurred each year. Vaccination of domestic animals is the primary reason for this decline. The incidence in wild animals, by contrast, has increased, particularly in skunks and, to a lesser degree, in raccoons, opossums, and bats. The disease is now much more common in foxes than in dogs.

Attempts to control rabies in the wild animal population have not been rewarding. Trapping and poisoning have not been satisfactory and probably do not constitute a desirable approach. The search for a "true reservoir" that can harbor the virus for long periods and transmit it at various times has not been completely rewarding. Some species of bats may serve as a maintaining reservoir, but it is not known how often contacts occur between bats and other animals proved to be rabid, how often terrestrial animals inhabit bat caves, nor why wild animal rabies is common in areas containing no large bat caves.

The possibility that rabies virus can survive in some species of animal as a latent infection must be entertained. If this agent exists in some animals, as do the viruses of herpes simplex in man or B virus in monkeys, the demonstration of such a relationship would clarify some of the epidemiologic questions regarding this disease. Under experimental conditions, the virus has survived eight and one-half months in guinea pigs, having been reactivated by stress factors. Spread by airborne infection or by contact with infected urine have been suggested. Animals in Carlsbad Caverns—where millions of bats roost—were protected from arthropods and contact with bats by screened cages. They subsequently developed rabies.

In man, the dominant problem with respect to rabies is fear. The annual mortality rate in the United States is extremely low. The principal

reason for fear, then, is that for the individual patient, once symptomatic, nothing can be done.

The epidemiology of animal bites is a fascinating study. Seven hundred thousand persons in the United States are bitten by animals according to the annual reports. The physician attending a bitten person should first determine the animal involved. Skunks, bats, and foxes are commonly rabid; squirrels and rats, rarely. Should a dog be involved, the incidence of rabies in the community must be considered. The animal should be quarantined; if infected, it would die within 10 days. The type and location of the bite, whether the patient has previously been given Pasteur treatment, and whether hypersensitivity to vaccine exists should be determined.

Also, the economic factor must be considered. More than 30,000 anti-rabies treatments are given annually in the United States at a cost of more than three million dollars. This expenditure is an index of the anxiety aroused by the disease. Another source of consternation is postvaccinial reaction, although it occurs in only 0.1% of cases. Duck embryo vaccine was developed to avoid this reaction, but success in its use is open to question. The speaker has personal knowledge of three deaths following vaccination with duck embryo vaccine. In each instance, the period from bite to death was long enough so that antibody response would have been anticipated. One other case of postvaccinial encephalitis attributable to this agent has been reported.

Progress in the study of rabies is represented by (1) the development of fluorescent antibody staining technics for demonstrating the virus in infected brain tissue, and (2) by the development of chicken embryo propagated live virus vaccine for use in immunizing dogs and cattle. The discovery of possible aerosol spread of rabies virus is another advance. Whether this phenomenon occurs in nature is being investigated.

Investigation of strains of virus isolated from nature that exhibit low virulence in inoculated laboratory animals is being carried out.

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Chagas' Disease. The clinical and epidemiologic importance of Chagas' disease justifies its inclusion in the public health plans of the countries where it is prevalent. The disease can attack the foetus in the womb, particularly affects children under 5 years, and causes important digestive and cardiac lesions in adults. The prevalence of the disease is largely due to poor quality rural housing and widespread ignorance of the part played by vectors in its transmission. The following were among measures recommended: spraying programs for eradication or reduction of Triatoma (T. megista) in dwellings (these would follow the completion of malaria eradication operations and use the same teams); reconstruction or repair of rural dwellings; epidemiologic surveys to assess the extent of the problem; and wider research on the pathogenesis, diagnosis, epidemiology, and therapy of the disease.

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SUBMARINE MEDICINE SECTION

CLINICAL PROBLEMS OF SCUBA DIVING

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Clinical Problems of SCUBA Diving

Since the introduction of self-contained underwater breathing apparatus (SCUBA) in the early 1950's, production and use of this diving equipment have increased at a truly fantastic rate. Although precise figures are not available, it is estimated that the number of civilian sports divers employing SCUBA gear number nearly one quarter million people in America today. Considering the physiological range covered by these sports divers, and in view of the inherent dangers of compressed-air diving, the emergence of clinical problems peculiar to SCUBA use was predictable. Because the pathology of hyperbaric exposure is so remote from commonly encountered clinical syndromes, medical practitioners are generally not prepared to cope with the accidents which result from this type of diving. In this context, a brief summary of major clinical problems of SCUBA diving may be in order.

Physical Requirements

Any approach to the medical hazards of compressed-air diving must commence with the basic, preventive question of candidate selection. Unlike the diving medical officer in the Navy, the civilian practitioner is taxed with an extremely difficult range of human beings who present themselves for medical approval relative to diving activities. At first thought, it might seem easy to eliminate all applicants who are overweight, over age, hypertensive, neurotic, or victims of chronic respiratory disorders. In civilian practice, however, the problem is not thus easily resolved. The would-be SCUBA diver will probably pursue his underwater activity, regardless of physical defects determined by examination. The physician, therefore, must accept the role of adviser, shorn of normal dictatorial powers. Enlightened advice, however, may avert casualties, and such advice is best received from the family doctor.

Evaluation of the potential SCUBA diver should probably be predicated on the likelihood that most candidates will dive regardless, and can best be served by a careful evaluation of the physical disabilities which may limit or preclude this activity. Since most diving casualties relate to abnormalities of the respiratory system, this is a prime object of surveillance. Problems relative to the middle ear and paranasal sinuses can rarely be predicted by ordinary examination. Ability of the individual to equalize pressure in these areas is probably best determined by a test of pressure, in an available chamber, or in underwater trial. In case of the lungs, however, the practitioner

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has better selective control. Any pulmonary lesion, such as cystic lung disease or healed extensive pulmonary histoplasmosis should be immediately and permanently disqualifying. The reason for this should be made clear to the patient: any condition which could lead to general (as in asthma) or localized trapping of air in the lungs, can result in a fatal case of arterial air embolism with a relatively minor pressure fluctuation. In addition, but of lesser importance, is the fact that impaired pulmonary function predisposes to increased carbon dioxide retention and development of decompression sickness, or "bends." Concerning the cardiovascular system, it may suffice to point out that underwater swimming with SCUBA gear is a most demanding physical exercise, comparing nicely with 440 and 880 yard competitive runs. If the candidate's cardiovascular system is inadequate for such a stress, he should be advised against SCUBA diving. Consideration of other body systems should be predicated on the simple fact that SCUBA swimming is hard work for the entire organism; the candidate should be impressed with this fact. Finally, the doctor and patient alike must understand that an underwater environment is both unnatural and hostile, and that any degree of emotional instability will increase the probability of dangerous accident.

Major Clinical Hazards

The major clinical hazards of SCUBA diving are threefold: arterial air embolism, bends, and drowning. Although the terminal fatal event is generally drowning, the proximate cause not infrequently can be traced to air embolism or massive and generalized bends. Because of popular confusion between bends and air embolism, it is important to describe these entities in more detail.

Air embolism occurs when massive quantities of inspired gas are forced through the alveolar cellular wall, to proceed via interstitial pathways toward the mediastinum. In this process, the gas may be forced into the pulmonary venous system, or else dissect into the loose tissues of the mediastinum. Should the gas enter the pulmonary venous system, it will pass directly to the left ventricle, and thence ultimately to the cerebral vessels, with blockage of circulation throughout the circuit. The quantities of gas which enter the circulation under these circumstances are massive, indeed. On at least one occasion, we have calculated more than one liter of air in the heart, aorta, and cerebral vessels of a fatal casualty. Treatment of air embolism consists in <u>immediate</u> recompression to a chamber depth of 165 feet, which reduces the intra-arterial gas volume by five-sixths, permitting resumption of normal blood flow. Subsequently over a period of thirty-five hours, reduction of pressure permits safe return to surface environment after the residual gases have been dissolved in the blood stream of the individual, and eliminated through the lungs.

It is unlikely that, in absence of recompression facilities, medical therapy will be of real value in treatment of an actual case of arterial gas embolism. The role of the practitioner, therefore, is that of a preventive adviser, since his judgment of potential pulmonary air trapping may be of critical importance to the diving candidate. In the event of a fatal occurrence of air embolism, however, it is vital that a meticulous autopsy be performed. Presently, SCUBA deaths are invariably labelled as drowning, and autopsies are not obtained; thus, the casual factor of air embolism is not documented. The incidence of fatal embolism cases in the Navy is fortunately small. It follows, therefore, that good information relative to this clinical entity is scarce. Additional autopsy findings which could be acquired in cases of civilian casualties would be of inestimable value in overall evaluation of the syndrome. More importantly, some estimate of the role of air embolism in SCUBA deaths might be available.

Decompression sickness, caisson disease, or "bends," represents a clinical syndrome quite distinct from arterial air embolism. As previously described, air embolism results from intra-arterial introduction of massive quantities of gas which passes through alveolar walls and terminates as emboli in the cerebral vessels. In the case of "bends," however, a different physical phenomenon is involved. The diver who breathes compressed air under increased ambient pressure will inevitably have a degree of nitrogen dissolved in his blood stream and tissues, depending on the depth and duration of the dive. Upon ascent, this inert gas must be eliminated through the lungs, or else come out of physical solution, producing gas bubbles. Such bubble formation in turn produces intravascular blockage or cellular distortion, either of which will result in tissue anoxia and pain. This pain, commonly centered in areas of poor vascularity, is the characteristic of divers' bends. Most likely sites of election are joint areas of the extremities, with rare involvement of the spinal cord.

In the treatment of "bends," as in the case of air embolism, recompression of the patient is a necessity. Because "bends" does not present a comparable hazard to life, however, a good deal of latitude is allowed in the time interval between accident and pressure treatment. Delays of several hours may be dictated by the distance to nearest recompression chamber. Such a delay will somewhat modify the therapeutic result, but it is important to emphasize that even greatly delayed treatment of bends will generally result in great improvement or total cure. If a delay is anticipated before delivery of the patient to a pressure facility, administration of opiates may be required for control of severe pain, although apparent improvement due to such drugs in no way changes the requirement for recompression treatment.

Minor Clinical Hazards

Although the practicing physician will not often be confronted with major diving accidents, his advice and treatment will frequently be sought in connection with minor casualties of everday diving. Almost invariably these derangements will result from unequal pressure differentials in the paranasal sinuses or the middle ear. During descent in the water, external pressure on the body will increase at a rate of about one-half pound for each foot of descent. Clearly, if this pressure is not equalized in the middle ear and sinuses, an unequal pressure differential will exist. In such a case, severe pain will be experienced, and accompanied by extravasation of blood and serum into the closed cavity. Because pressure equalization during ascent is easy and automatic, relief of pain is achieved by return to the surface. The diving enthusiast now presents himself to the physician for diagnosis, treatment, and advice relative to future diving activities. The history of a recent dive, coupled with evidence of extravasated blood in the middle ear or sinuses, will make the diagnosis simple, and in practically all cases active therapy is not required. The question of future diving activity, however, is not so simply resolved. Generally speaking, occurrence of ear or sinus squeeze at rare intervals should not be contraindication to further diving activities, and might be considered a minor occupational hazard of the sport. Persistent inability to equalize pressure, however, may permanently disqualify the subject for further pressure exposure. In selected individuals, radiation of lymphoid tissues near the eustachian ostia will ultimately permit normal equalization of the middle ear, and suitable therapy for chronic or acute sinusitis may guarantee equalization of these cavities. Generally speaking, the ability to "clear" the ears is a function of time and practice, making prognostication difficult in any event, and occasionally embarrassing.

Summary

In brief narrative, an attempt has been made to elicit major and minor clinical hazards of SCUBA diving. With the predictable increase in numbers of diving enthusiasts, physicians throughout the United States will be expected to understand and treat the pathologic results of pressure exposure. Familiarity with these syndromes will improve the effectiveness of the medical practitioner with respect to advice as well as treatment.

Seven references are cited in the original article.

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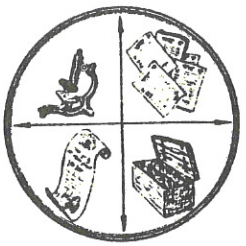

MISCELLANY

Information for All Persons Going on TAD

In the interest of conserving temporary additional duty travel funds, Commanding Officers are reminded of certain provisions of Joint Travel Regulations regarding government quarters. Paragraph 1150-5 defines the term government quarters, as used in the regulations, as any sleeping accomodation owned or leased by the U. S. Government provided it is made available to, or utilized by, the member concerned.

Paragraph 4451 requires members in a travel status to utilize available government quarters to the maximum extent practicable and provides for certification of the Commanding Officer or his representative at the temporary duty station as to the nonavailability of government quarters in support of claims for the full per diem for temporary duty of 24 hours or more at military installations.

It has been ascertained that many commands endorse orders indicating that government quarters are not available because the available quarters are substandard.

In view of the above provisions, the existence of any available usable government quarters providing sleeping accommodations would preclude entitlement to the quarters portion of per diem, and an "all out" effort should be made to provide sleeping accommodations for members reporting for temporary additional duty.

—Published by Direction of the Surgeon General,
Rear Admiral E. C. Kenney, Medical Corps, U. S. Navy

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FILM LOANS

The following films have been donated to the AFIP through the gracious cooperation of the Intersociety Committee for Research Potential in Pathology, Inc., and are available for loan to Federal and Civilian scientific requestors.

AFIP-86 Electron Microscopy of Normal and Leukemic Leukocytes
AFIP-87 Blood Fractions in Clinical Medicine
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AFIP-90 We Speak Again - The Rehabilitation of Laryngectomized Patients
AFIP-91 Organic Disorders of the Larynx
AFIP-92 Ostoscopic Cinematography of the Tympanic Membrane and Middle Ear
AFIP-93 Esophagoscopic Views of Lesions of the Esophagus
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AFIP-98 Normal Astrocytes (Living Human Cells in Culture Series)
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AFIP-113 Principles of Respiratory Mechanics, Pt. I
AFIP-114 Principles of Respiratory Mechanics, Pt. II
AFIP-115 Innovations in Transfusion Therapy
AFIP-116 Intestinal Obstruction due to Ascaris Lumbricoides
AFIP-118 The Ultimate Structure
AFIP-127 Action of Human Heart Valves
AFIP-128 Dissection of a Mosquito for Malaria Parasites

Requests for film should be directed to: The AFIP Film & Equipment Exchange
Washington, D. C. 20305

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Meeting of the American College of Physicians

Medical officers planning to attend the annual meeting of the American College of Physicians at Atlantic City, New Jersey, 6 - 10 April 1964, are advised that the Armed Forces tri-service social hour will be held under Air Force auspices on the evening of Tuesday, 7 April, at the Madison Hotel. Further details will be available at the meeting. All military officers attending the annual session, their wives, and guests are invited to attend. Details concerning the Navy Chiefs of Medical Service dinner will be announced in the near future.

—Medicine Branch, ProfDiv, BuMed

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Officers' Wives Club Scholarship Award

The Officers' Wives Club of U. S. Naval Hospital, Oakland, Calif., announces the establishment of annual scholarship awards to be used for education at or beyond college level. This award is to be used at any generally accredited college or university by an applicant deemed most promising on the basis of merit and scholastic promise with financial need to be considered only in the case of equally worthy applicants.

The applicant must be the son or daughter (natural, adopted, or step-child) of an officer (Chief Warrant Officers included) in the Medical Corps, Dental Corps, Medical Service Corps, or Chaplains Corps, who is now serving on active duty in the Regular Navy or on extended active duty with reserve status within the limits of the 12th Naval District; or if the officer is deceased or retired at the time of application, his last duty station must have been within this area.

The awards are in the form of an outright grant to be made each year in an amount not to exceed $300. The number and value of the awards each year are determined by the Club based on available funds. These awards will become available for the academic year commencing September 1964.

Application forms may be obtained by mail or in person from the Administrative Officer, U. S. Naval Hospital, Oakland 14, Calif.

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MEMBERSHIP IN THE AMA

The AMA Constitution and bylaws have been amended and now provide for the following types of memberships for medical officers on active duty in the Navy:

1. Active Service Members—Career officers of the Medical Corps of the U. S. Navy and U. S. Naval Reserve on extended active duty. Service members shall have the same rights and privileges as regular members, but shall not be required to pay dues and shall not be entitled to receive Today's Health or any scientific publication of the AMA except by personal subscription.

2. Special Associate Members—Non-career officers of the Medical Corps of the U. S. Naval Reserve on active duty. Associate members may attend meetings of the Postgraduate Assembly, but may not vote or hold office in the AMA. They shall not be required to pay dues and shall not be entitled to receive Today's Health or any scientific publication of the AMA except by personal subscription.

The names of all medical officers on active duty will be submitted for membership. No action to obtain membership is necessary by the individual active duty doctor.—Professional Division, BuMed

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FROM THE NOTE BOOK

Announcement of Correspondence Course

The Medical Department Correspondence Course, Pharmacy and Materia Medica, NavPers 10999-A, is now ready for distribution to eligible regular and reserve officer and enlisted personnel of the Armed Forces. Applications for this course should be submitted on Form NavPers 992 (with appropriate change in the "To" line) and forwarded via appropriate official channels to the Commanding Officer, U. S. Naval Medical School, National Naval Medical Center, Bethesda, Md., 20014.

This course is based on Chapters 7 and 8 of the Handbook of the Hospital Corps, NavMed P-5004. Areas presented are: Basic Pharmacology, Review of Toxicology, and Pharmacy. The Pharmacology section outlines action, usage, dosage, and side effects, and includes notes of caution on many drugs currently used in the Navy. A Review of Toxicology covers basic toxicology, the antidote locker, and treatment for specific poisons. The Pharmacy section covers metrology, the prescription, and pharmaceutic preparations, processes, and incompatibilities.

The course consists of seven (7) objective type assignments and is evaluated at twelve (12) Naval Reserve promotion and/or nondisability retirement points. These points are creditable only to personnel eligible to receive them under current directives governing retirement and/or promotion of Naval Reserve personnel. Personnel who have completed NavPers 10999 will receive additional credit for completing this revision.

—Submitted by Captain J. H. Stover Jr, MC USN,
Commanding Officer, U. S. Naval Medical School, NNMC

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Medical Department Praised for Job Well Done

The following is an excerpt from a recent letter from the Director of the Naval Sea Cadet Corps to the Surgeon General of the Navy:

> On behalf of the Chairman and the Board of Directors of the Naval Sea Cadet Corps, I would like to express our appreciation to and through you for the wonderful support that the members of the Medical Department have given to our Navy League councils in the support and administration of units of our cadet corps in its inception and expansion to 92 activities during the past four years. We have enjoyed thousands of Navy standard physical exams, and many hours of instruction conducted on a voluntary basis by members of the Medical Corps.
>
> As we continue to expand the program to all of our 468 Naval Reserve Training Activities, we will continue to need the volunteer services for physical examinations and instruction of our Sea Cadets who enjoy the privileges of training on our Naval Reserve curriculum.

Disestablishment of Formal Training Course in Neuropsychiatric Clerical Technic, and Cancellation of the Navy Enlisted Classification Code HM-8444, Neuropsychiatric Clerical Technician.

"The Bureau of Medicine and Surgery Advisory Board has recommended and the Surgeon General approved the disestablishment of a formal training course for Neuropsychiatric Clerical Technic, and cancellation of the Navy Enlisted Classification code HM-8444, (Neuropsychiatric Clerical Technician). Formal training at the U. S. Naval Hospital, NNMC, Bethesda, Md., will be discontinued upon graduation of the class to be convened 6 April 1964. Additional classes to be convened, as promulgated by BUMEDINST 1510.41, have been canceled.

All personnel now assigned the Navy Enlisted Classification code HM-8444 (Neuropsychiatric Clerical Technician), will be redesignated HM-8485, (Neuropsychiatry Technician). The Navy Manpower Authorization, NAVPERS 576 and the Manual of Navy Enlisted Classifications, NAVPERS 15105-E will reflect this change in June 1964. The Bureau will additionally cause this deletion to be reflected in forthcoming changes to the Catalog of Hospital Corps Schools and Courses and related publications distributed by BUMED.

The Bureau of Medicine and Surgery Advisory Board further recommended and the Surgeon General approved a policy that training required to provide neuropsychiatric clerical services be accomplished by on-the-job training at the E-5 (HM2) level, utilizing Neuropsychiatry Technicians currently on board. NO medical specialty designation to be assigned."

—Hospital Corps Division, BuMed

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Naval Medical Research Reports

U. S. Naval Medical Research Institute, NNMC, Bethesda, Md.

1. The Use of Low Molecular Weight Dextran in Extracorporeal Circulation Hypothermia and Hypercapnea: MR 005.12-0002.04 Report No. 14, July 1962.
2. Susceptibility of Certain Japanese Mosquitoes to Plasmodium Gallinaceum and Plasmodium Berghei: MR 005.09-1030.02 Report No. 7, August '62.
3. Toxic Effects of Oxygen at High Pressure on the Metabolism of D-Glucose by Dispersions of Rat Brain: MR 005.14-3001.02 Report No. 2, August '62.
4. Simple Technique for Direct Cannulation of Rat Salivary Ducts: MR 005.12-5000.04 Report No. 3, September 1962.
5. The Response of Blood-Fed Aedes aegypti to Gamma Radiation: MR 005.09-1401.01 Report No. 4, November 1962.
6. Elevation of Internal Body Temperatures During Transient Heat Loads and at Thermal Equilibrium: MR 005.01-0001.02 Report No. 1, June 1963.

Naval Medical Research Reports, NMRI, Bethesda, Md., (Continued)

7. Structure Vs Toxicity Relationships in Aryl Esters of Tropine and ψ-Tropine. V. MR 005.06-0010.01 Report No. 30, September 1963.
8. Effect of X-Irradiation in Sub-Lethal to Supra-Lethal Dosage on Serum Glutamic Oxalacetic Transaminase: MR 005.08-5100.01 Report No. 1, October 1963.
9. Microdetermination of Chloride in Blood Plasma and Cells by Spectrophotometric Analysis Using Solid Silver Iodate: MR 005.02-0011.01 Report No. 2, December 1963.

U.S. Naval Medical Research Unit No. 3, Cairo Egypt

1. Ecological Studies of Phlebotomus Sandflies in the Paloich Area, Upper Nile Province, Sudan (Malakal Sub-Unit): MR 005.09-1605, October 1963.
2. In Vivo and In Vitro Analysis of the Mechanisms of Pathogenicity in Human Schistosomiasis: I. Method for isolation of large numbers of schistosome eggs en masse from tissues. Studies on tissue culture and chemotaxis: MR 005.09-1035.11, November 1963.

U.S. Naval Air Development Center, Aviation Medical Acceleration Laboratory, Johnsville, Penna.

1. The Non-Protein Amino Acids and Related Compounds of Rat Liver Mitochondria: MR 005.13-0002.7 Report No. 21, October 1963.
2. A Theory of Ion Transport Across Cell Surfaces by a Process Analogous to Electron Transport Across Liquid-Solid Interfaces: MR 005.13-0002.7 Report No. 24, December 1963.
3. Psychological Aspects of Water Immersion Studies: MR 005.13-0005.7 Report No. 7, December 1963.
4. Psychophysiological Aspects of Reduced Gravity Fields: MR 005.13-0005.7 Report No. 6, December 1963.

U.S. Naval Medical Field Research Laboratory, Marine Barracks, Camp Lejeune, N.C.

1. Patterns of Illness in Rhinovirus Infections of Military Personnel: MR 005.09-1204.4.11, November 1963.

U.S. Naval Medical Research Laboratory, U.S. Naval Submarine Base, New London, Conn.

1. Discrimination of Color III. Effect of Spectral Bandwidth: MR 005.14-1001-1.31 Report No. 410, September 1963.
2. Speech During Respiration of a Mixture of Helium and Oxygen: MR 005.14-1001-4.03, October 1963.
3. Functions of the Medical Officer Aboard a Fleet Ballistic Submarine: MR 005.14-3002-4.10, Report No. 414, October 1963.
4. Lighting Survey of USS HARDHEAD (SS365) Memo Report No. 63-12: MR 005.14-1100-1.15, November 1963.
5. Autonomic Resiliency, Subjective Symptomatology, and Submarine Stress Memo Report No. 63-13: MR 005.14-2100-3.05, November 1963.

Naval Medical Research Reports, New London, Conn., (Continued)

6. Loudness Discrimination: MR 005.14-1001-2.15 Report No. 417, December 1963.
7. Exercise Tolerance Studies in an Artificial Atmosphere Under Increased Barometric Pressure: MR 005.14-3002.11, January 1964.

U.S. Naval Hospital, Clinical Investigation Center, Oakland, Calif.

1. Hydroxyproline Excretion in Endocrine Disease: MR 005.12-1608, September 1963.
2. An Oral Gelatin-Xylose Test for Estimating Pancreatic Proteolytic Activity: MR 005.12-1608, December 1963.

U.S. Naval School of Aviation Medicine, Naval Aviation Medical Center, Pensacola, Fla.

1. A Note on the Influence of Shield Geometry on Air Dose and Tissue Dose from Protons Within a Space Vehicle: MR 005.13-1002 Subtask 1 Report No. 25, April 1963.
2. Class Standing at the U.S. Naval Academy as a Predictor of Success in Naval Aviation Training: MR 005.13-3003 Subtask 1 Report No. 37, April 1963.
3. A Brief Vestibular Disorientation Test: MR 005.13-6001 Subtask 1 Report No. 82, May 1963.
4. Excretion of 17-Hydroxycorticosteroids, Catechol Amines, and Uropepsin in the Urine of Normal Persons and Deaf Subjects with Bilateral Vestibular Defects Following Acrobatic Flight Stress: MR 005.13-0004 Subtask 2 Report No. 1, May 1963.
5. Observation of the Elevator Illusion During Subgravity Preceded by Negative Accelerations: MR 005.13-6001 Subtask 1 Report No. 83, May 1963.
6. The Wolff-Parkinson-White Syndrome as an Aviation Risk: MR 005.13-7004 Subtask 5 Report No. 15, May 1963.

U.S. Navy Medical Neuropsychiatric Research Unit, San Diego, Calif.

1. Studies of Classical Heart Rate Conditioning in the Rat: Report No. 63-3, January 1963.
2. Photic Activation and Photoconvulsive Responses in a Nonepileptic Subject: MR 005.12-2304 Subtask 1 Report No. 62-8, July 1963.
3. Response Specificity for Difference Scores and Autonomic Lability Scores: Report No. 63-12, August 1963.
4. Emotional Symptoms in Extremely Isolated Groups: MR 005.12-2004 Subtask 1, October 1963.
5. Measurement of Group Effectiveness in Natural Isolated Groups: Report No. 63-16, October 1963.
6. Some Attributes of Spontaneous Autonomic Activity: MR 005.12-2304 Subtask 1 Report No. 62-19, 1963.
7. A Study of the Validity of Mail Questionnaire Data: MR 005.12-2004 Subtask 1 Report No. 63-7, 1963.

DENTAL SECTION

Interaction Of Human Serum Proteins With Local Anesthetic Agents

Vincent J. Sawinski and Gustav W. Rapp, Departments of Biochemistry, Physiology and Pharmacology, Dental School, Loyola University, Chicago, Illinois. Jour. of Dental Res. 42(6): 1429-1438, November-December 1963.

The property of serum proteins, especially albumin, to bind certain positively charged ions (cations), among which may be included local anesthetic agents, has been studied by Sawinski and Rapp. The clinical significance of this study is not clear since the data did not show that these serum proteins are a priori necessary for either the anesthetic efficiency or successful elimination of these agents from the body.

Four local anesthetics were studied, procaine, butethamine, lidocaine, and mepivacaine (Novocaine, Monocaine, Xylocaine and Carbocaine). Each anesthetic was made up in concentration from 0.2 to 0.002% in M/15 phosphate buffer pH 7.0. Human serum albumin (.2% in M/15 phosphate at pH 7.0) was then dialyzed against these local anesthetic solutions for four days or until the system came to equilibrium. The remaining concentration of anesthetic agent in the dialyzing solution outside the bag was measured and the decrease in molarity was taken as an indication of the binding affinity of albumin in that particular system. The authors postulated that the human albumin molecule has two binding sites for cationic local anesthetics. Novocaine and Monocaine showed affinity constants 2 orders of magnitude lower than Xylocaine and Carbocaine. This difference was apparently due to internal ester (procaine and butethamine) or amide (lidocaine and carbocaine) linkages. It is tempting to speculate that the apparent greater affinity of Xylocaine and Carbocaine for serum albumin constitutes a physiologic disadvantage to the extent that these anesthetics might be less readily detoxified in the circulating plasma.
(Submitted by CDR K. C. Hoerman, DC, USN, N.M.R.I., Bethesda, Md.)

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A Portable Dental Sterilizing Cylinder

CDR L. W. Wachtel, MSC, USN and CAPT L. M. Armstrong, DC, USN, Naval Dental School, NNMC, Bethesda, Maryland. Research Report, 28 June 1963.

The most reliable medium recommended for the sterilization of dental instruments is superheated steam. However, superheated steam cannot be employed under emergency field conditions that do not permit the use of conventional equipment such as autoclaves; nor can it be used to sterilize dental instruments that will corrode if placed in water. Currently, no accepted method of sterilizing dental instruments will satisfy emergency conditions and, at the same time, safeguard corrosion-susceptible instruments.

Chemical sterilization with ethylene oxide gas has been shown to be less damaging to many types of materials than any known method of sterilization, but the gas is extremely flammable and must be mixed with an inert gas such as carbon dioxide or dichlorodifluoromethane (Freon-12*). When it is mixed with 90 per cent carbon dioxide or 88 per cent Freon, ethylene oxide gas is safe and will not burn. The advantage of the Freon mixture is that it may be packaged in small containers at low pressures of 3 to 5 atmospheres.

Temperature is an important factor in sterilization with ethylene oxide. At room temperature an exposure time of as long as 16 hours may be required, but the time can be reduced by increasing the temperature. Phillips reported a reduction in sterilization time by a factor of 2.74 for each 10° C. rise in temperature between the range of 5° and 37° C. Sterilizers utilizing ethylene oxide at elevated temperatures are available commercially, but the smallest units on the market are expensive and not easy to employ under emergency conditions.

The purpose of our study was to fabricate a device that could be used to sterilize dental instruments rapidly, that could be employed under emergency field conditions, and that would protect the instruments being sterilized.

Materials And Methods

A sterilizer was made from an aluminum tube approximately 9 inches in length and having an outside diameter of 1 3/4 inches and an inside diameter of 1 1/2 inches. The tube was sealed at both ends by aluminum threaded plugs 3/4-inch thick. These plugs were fitted with plastic gaskets made from silicone rubber (Silastic RTV 502**). Each plug was vented by means of a small brass petcock. When sealed, the cylinder was found to be capable of withstanding at least 7 p.s.i. internal pressure without leaking.

To operate the sterilizer, one of the end plugs was removed, and clean, dry instruments were inserted in the cylinder. After the plug had been replaced and tightened sufficiently to prevent leaking, an ethylene oxide container was connected to one of the opened petcocks, and gas was flushed through the cylinder for about 10 seconds to ensure replacement of the air by the sterilizing gas. Both petcocks were then closed tightly, and the cylinder was immersed in boiling water for 1 hour. The ethylene oxide gas mixture selected

*Freon is the trademark for fluorinated chlorohydrocarbons produced by E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.

* *The Dow Corning Corp., Midland, Mich.

for this study was an experimental mixture containing 19 per cent ethylene oxide and 81 per cent Freon-12.

To determine the effect of the procedure on dental instruments likely to corrode, several tungsten carbide (high carbon) steel burs, carbide steel chisels, and scalpel blades were put through the sterilizing system 12 times.

The sterilizing effectiveness of the procedure was tested using corrosion resistant stainless steel explorers, carvers, and knives that had been contaminated by swabbing with a suspension of Bacillus subtilis (globigii) spores. These contaminated instruments, along with bacterial spore strips (Spordex*), were placed in the sterilizing cylinder, subjected to the sterilizing system, and then transferred to test tubes containing beefheart infusion broth as a culture medium. After incubation at 37° C. for 2 days, the broth contained in each tube was examined to determine whether there had been any bacterial growth.

Results

No visible corrosion or alteration of the steel burs and instruments was noted after 12 sterilizing procedures.

Contaminated instruments and spore strips were successfully sterilized by the procedure employed, as evidenced by the absence of bacterial growth after the instruments had been placed in broth and incubation at 37° C. had proceeded for 2 days.

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Procedures Preceding The Prosthodontic Prescription

M. M. DeVan, D.D.S. Univ. of Pa., The Graduate School of Medicine, Philadelphia, Pa. Jour. Pros. Den. 13(6): 1006-1010, November, December 1963.

Dr. DeVan discusses diagnosis in relation to complete dentures from the standpoint that this is one of the most important parts of the prosthodontic service. Failure to make an adequate diagnosis causes a high percentage of denture failures. He presents seven steps in the diagnostic service. By following these, patients would be treated more satisfactorily than if the diagnosis consists of the observation that the teeth are missing and that the residual ridges are large or small on large or small dental arches.

The steps presented and discussed are: (1) roentgenograms of the residual bone; (2) alginate (irreversible hydrocolloid) impressions; (3) diagnostic denture models which incorporate the maximum vertical dimension permitted by the musculature; (4) the mounting on an articulator of the denture models in centric relation; (5) transillumination of the sinuses and examination of the

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* The American Sterilizer Co., Erie, Pa.

patient's lips, cheeks, throat, and tongue; (6) recordings of the denture history; and (7) the prescription and presentation of the findings to the patient.

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Powdered Gold As A Restorative Material

Melvin R. Lund, D.M.D., M.S., and Lloyd Baum, D.M.D., M.S.
Loma Linda University, School of Dentistry, Loma Linda, California.
Jour. Pros. Den. 13(6): 1151-1159, November, December 1963.

Doctors Lund and Baum introduce a new form of cohesive gold for condensed restorations. The powdered gold is wrapped in cohesive foil and the technique of condensation is simplified. In many cases, hand pressure alone is sufficient to yield a hardness which compares favorably to conventional foil restorations. Approximately 1500 restorations of powdered gold are under observation and, up to publication of this article, the enduring qualities appear favorable.

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Personnel and Professional Notes

Navy Opens Dental Research Facility At San Diego. On 16 January 1964, the Administrative Command of the Naval Training Center, San Diego, opened a newly installed clinical dental research facility at the Naval Electronics Laboratory, San Diego, California. The new facility is an expansion of the guest privileges first granted in 1952 to dental officers of the Administrative Command to make available the extensive scientific equipment and consultative services of the Naval Electronics Laboratory for exploring dental problems. Since that date, dental studies have been conducted at the Naval Electronics Laboratory for exploring dental problems. Since that date, dental studies have been conducted at the Naval Electronics Laboratory by Captains A. R. Frechette, A. K. Kaires, N. W. Rupp, and R. R. Perkins, of the US Naval Dental Corps.

The last-named investigator developed a prototype instrument capable of recording basic electric characteristics of human teeth. To determine which conductivity parameters can be correlated with the susceptibility of an individual tooth to disease, it became necessary to provide a clinical facility at the Naval Electronics Laboratory, to bring relatively large numbers of patients to the extensive electronic equipment. To meet this requirement, the NEL provided space for construction of the new laboratory, dark room, dental operating room, and office.

Participating in the ceremonies were: RADM F. M. Kyes, DC, USN, Assistant Chief of the Bureau of Medicine and Surgery for Dentistry and Chief of the Dental Division; CAPT L. W. Rogers, USN, Commanding Officer of the Naval Training Center's Administrative Command; CAPT H. C. Mason, USN, the Naval Electronics Laboratory's Commanding Officer and Director; and

CAPT B. H. Faubion, DC, USN, District Dental Officer for the ELEVENTH Naval District, and Dental Officer, US Naval Training Center, San Diego.

Fluoridation Wins In New York City. The long-standing preventive dentistry program, sponsored by the dental profession, took a giant step forward with the passage of fluoridation by the New York City Council and Board of Estimate. If the recent findings of a study in New Britain, Connecticut are substantiated, older citizens will benefit along with the younger people who will have a 60 percent reduction in the incidence of dental caries.

This study in New Britain by Dr. Paul D. Rosahn reports that there is "suggestive evidence still under review, and not yet fully authenticated, that a fluoridated water supply may possibly be one of several variables which have been responsible for the prolongation of life, or the postponement of death." He said that the percentage of all deaths for those people under the age of 20 decreased from 21 to 17 percent by comparing the before fluoridation (1951) period autopsies to those in the period after fluoridation.

Dr. Rosahn's study involved 3,296 human autopsies from 1937 to 1962. He based his statements on the fact that his study showed there had been no significant changes in death rates due to kidney, cardiovascular, liver, and cancer diseases.

Navy Presentations At Chicago Dental Society Midwinter Meeting. Four dental officers from the Naval Training Center, Great Lakes, Illinois, presented Table Clinics at the 99th Midwinter Meeting of the Chicago Dental Society, February 2 to 5, 1964, at the Conrad Hilton Hotel, Chicago, Illinois. Captain William E. Ludwick, DC, USN, presented "Wearing Rubber Gloves for Operative Dentistry." Captain William I. Gullett, DC, USN, presented "A New Design for Occlusal Rests." Lieutenant Commander Harris J. Keene, and Lieutenant Richard J. Grisius, DC, USN, collaborated on "Mass Casualty Training for Dentists."

Captain Myron G. Turner, DC, USN, is the Dental Officer, Administrative Command, USNTC, Great Lakes, Illinois.

The Second Annual Postgraduate Course In Forensic Dentistry. The Armed Forces Institute of Pathology, Washington, D.C., recently presented the second annual postgraduate course in Forensic Dentistry. The course was directed by Captain Henry H. Scofield, DC, USN, Chief, Dental and Oral Pathology Division. Major Bruce C. Young, MPC, USA, Chief, Legal Medicine Section, Forensic Pathology Branch, and 1/Lt. Philip A. Faix, Jr., USAF, MSC, Legal Counsel to the Director served as Associate Course Directors.

The course was attended by 46 Military and Civilian Dentists, Military Investigators, and JAG Corps Officers. Among those in attendance was Dr. Gerard J. Casey, Secretary of the Council on Hospital Dental Services of the American Dental Association. Guest lecturers included Dr. John J. Salley, Dean of the University of Maryland School of Dentistry, Dr. David B. Scott, Chief of the Laboratory of Histology and Pathology, National Institute of Dental

Research, Mr. Herbert Lassiter, Secretary of the Council on Federal Dental Services, American Dental Association, and Mr. Harvey Sarner, Secretary of the Judicial Council, American Dental Association. The highlights of the course included a laboratory session involving the identification of human remains by means of dental records, and a "Mock Court Trial" depicting the role of a dentist as an ordinary or expert witness.

——AFIP LETTER, Armed Forces Institute of Pathology, Washington, D. C.

NOTE: Captain Henry H. Scofield, DC, USN, has been appointed Chief, Dental and Oral Pathology Division, Armed Forces Institute of Pathology, and Registrar, ADA Registry of Oral Pathology. He was previously Head, Oral Pathology Division, U. S. Naval Dental School, Bethesda, Maryland.

—— Editor

Captain Alfred L. Raphael Presents Lecture To Local Dental Group. Captain Alfred L. Raphael, DC, USN, Acting Commanding Officer of the U. S. Naval Dental Clinic, Guam, M.I., presented a lecture with slides on the treatment of disorders of the Temporal-Mandibular Joint at the October 1963 meeting of the Guam Dental Society at Anderson Air Force Base. Approximately Thirty-five persons were in attendance for the lecture. Captain Raphael is a Diplomate of the American Board of Periodontology.

Captain T. J. Pape Presents Lecture To Local Dental Group. Captain Thomas J. Pape, DC, USN, an Oral Surgery Resident at the U. S. Naval Hospital, Great Lakes, Ill., presented a lecture entitled "Complications of the Maxillary Sinus" before the Kenosha Dental Society on 12 November 1963 in Kenosha, Wisconsin. Captain Joseph F. Link, DC, USN, is Chief of Dental Service at the U. S. Naval Hospital, Great Lakes.

Naval Dental School Sends Twenty-Nine Advanced Dental Technicians To The Field. Certificates for successful completion of Advanced Training Courses in the Enlisted Schools of the U. S. Naval Dental School were awarded to twenty-nine dental technicians at graduation exercises on 13 December in the main auditorium, National Naval Medical Center, Bethesda, Maryland.

"The Role of the Individual in Group Progress—Personal Creativity" was the theme of an address to the graduates by Captain Nelson W. Rupp, DC, USN, Head, Training Section, Professional Branch, Dental Division, Bureau of Medicine and Surgery.

Captain A. R. Frechette, DC, USN, Commanding Officer of the Dental School, presented letters of commendation to those students with the highest averages in their respective fields of Dental Technology: Dominic G. Zaia, DTCA, Advanced Prosthetic; Felix S. McGeary, DT1, Advanced General.

Felix S. McGeary also received the eighth Thomas Andrew Christensen Award in recognition of his loyalty and devotion to duty in the U. S. Navy. Established by the Naval Dental School to honor the only Naval Dentalman

Posthumously presented the Navy Cross for extraordinary heroism, the award will be presented, from time to time, to a graduate of an enlisted course of instruction who will be chosen on the basis of his service record and service reputation.

Captain Frechette, assisted by Captain R. R. Troxell, DC, USN, Head Enlisted Education Department, awarded certificates to nineteen graduates of the Advanced General School and ten of the Advanced Prosthetic School.

Navy Communication Station Holds Open House For Two Philippine Dental Societies. The Dental Department of the U. S. Naval Communication Station, San Miguel, Zambales, Philippines hosted an open house for members of the Zambales, and Olongapo Dental Societies on 15 December 1963.

Captain B. D. Gaw, USN, Commanding Officer of the Communication Station welcomed honored guests and the members of the two Philippine Dental Societies. Captain A. Bartelle, DC, USN and Lieutenant R. P. Jones, DC, USN, presented patients to demonstrate treatment technics performed in the Dental Department. Presentations included: a full mouth rehabilitation for a five year old dependent using cement-alloy restorations, an endodontia patient and a periodontia patient. Lectures were given on Oral Diagnosis and Treatment Planning as practiced at the U. S. Naval Communication Station, Preventive Dentistry and Oral Hygiene, and several aspects of the partial denture service.

Newly Standardized Items Available For Issue

FSN	NOMENCLATURE	UNIT ISSUE	UNIT PRICE
L6520-055-1518	Frame, Dental Laboratory Saw	EA	1.40
L6520-055-1519	Blade, Dental Laboratory Saw	PG	1.40
L6520-082-2673	Mouthpiece, Saliva Ejector, Dental, Plastic, Disposable, 500's	PG	15.40
L6520-721-6290	Bur, Dental Excavating, AHP, Tungsten Carbide, No. 8, 6s	PG	2.60
L6520-889-7498	Crown Set, Temporary, Dental, CRS Posterior Crown Assorted, Set of 36	SE	7.60
L6520-889-7499	Crown Set, Temporary, Dental, CRS Anterior Crown Assorted, Set of 36	SE	7.50
L6520-890-1382	Processing Unit, Dental Resins	EA	32.50
L6520-890-1386	Spreader, Gutta Percha, Dental, No. 3	EA	1.70
L6520-955-5275	Carrier Amalgam, Ivory Type	EA	1.90
L6520-960-2639	Bur, Dental Excavating, Friction Grip AHP, Tungsten Carbide, No. 699, 6s	PG	2.70
L6520-960-2640	Bur, Dental Excavating, Friction Grip AHP, Tungsten Carbide, No. 700, 6s	PG	2.60

L6520-973-5079	Evacuator, Oral Cabity, Dental, 110 volt 60 cycle, AC (For S. S. White Units)	EA	150.00
L6520-982-9622	Articulator, Dental Plain Line	EA	6.07
L6520-982-9892	Wheel Abrasive, Alum Oxide, Sq. Edge 11/2 X 0.033, 100s	PG	4.30
L6520-966-3729	Furnace, Dental Lab, Electric Muffle Type Lrg. with Pyrometer Automatic Temperature Control, 110V 60 Cycle AC	EA	231.00

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AVIATION MEDICINE DIVISION

Flight Physiology Notes

From: Aviation Physiology Training Unit, U. S. Naval Air Station, North Island.

J. A. M.

(Keeping "Out Of" Type)

Aircraft accident responsibility undergoes cyclic changes which can not always be clearly defined. In the good old days it was the fragile aircraft structure that contributed significantly to accidents and prevention was accomplished by flying only under ideal conditions. As demands for flights under more adverse conditions increased it was necessary to strengthen supports, improve fabrics and power plant reliability. In general, the emphasis was upon making the aircraft safe. As engineers became convinced that their contributions were adequate, a new term "pilot error" enjoyed, (still does), wide acceptance as a "cause" of accidents. It is unfortunate because little search was done beyond this point until attention was directed to the internal environment of the cockpit and the interface between the aircraft and pilot. This awakening of the importance of man in this man-machine combination started the era of display-control relationships, analysis of eye movements for instrument location, what instruments were watched, and for how long, location of controls, shape of handles, etc. Following along with this, simulators and procedural trainers became a dominant part of training and a vocabulary grew along with these developments to include such things as learning, set and

transfer, fixation, purpose drive, etc., and the field of human engineering and human factors blossomed.

It was soon discovered that learning did not undergo transition as rapidly as man changed aircraft types. To further complicate matters, advances in aircraft design continued to increase the overall performance; now consideration also had to be given to man's physiological needs in order to keep the man-machine relationships compatible. Physical standards had to be reviewed and medical selections improved. "G" tolerance, spatial disorientation, hypoxia, hyperventilation, vital capacity and cardiovascular responses ..... all had to be evaluated as to their contributions to pilot error. Trying to keep man as error-free as possible in this man-machine combination is a real challenge.

Many people in the various physical science disciplines have strongly recommended that man be dropped from the system and replaced by the now highly sophisticated computer systems. They argue that the support systems, (G suits, pressure suits, 0_2 equipment, poopy suits, hard hats, etc.), introduce a delicate balance wherein the support system, per se, now produces its own potential source of accident, as a result of delayed reaction time, limited mobility, fatigue, claustrophobia and psychic trauma. Fortunately the space program not only re-established the vital role of man in the man-machine relationship, but demonstrated the fact that man could adapt and perform effectively and efficiently even though encumbered with all necessary support protective equipment. It is interesting to note that man with properly designed support equipment can better withstand flight stress than can the computer and mechanical systems.

Investigation as to the cause of accidents continued and led back to displays with questions of "what" to display and "why" rather than "where" and "how". Today the pilot has intergrated displays, power boosted systems, automatic ejection system, pressure suits, automatic pilot and a host of other gadgets, electronic and otherwise, which are designed to help eliminate error and to provide safety and comfort. All of these apparently do their jobs well. But the pilot still has accidents, undoubtedly due to "pilot error/human factors". Accidents do occur in "perfect flying weather" and under ideal flying conditions of both pilot and aircraft. Is it possible that man can be too protected and too comfortable? It is perhaps time that we give some thought to the potential hazard of stimulus poor environments and such things as pre-occupation, behaviors, micro-sleep, and fatigue. In order for man to remain alert there must be a constant change in his external and/or stimulus environment. Stimuli which come either infrequently or with steady uniformity result in decreased attention. There are conditions in which man is oblivious of sensory inputs even though they objectively exist. Anticipatory behavior is one of these conditions, and accidents will occur when the estimate or anticipation is faulty, when things one expects to hold constant vary or when the pilot fails to take a variable into consideration. This is particularly true when fatigued, when the task becomes too routine, or things are "too good", the anticipated "cut" in carrier landings, the "almost home" or "got it made", the premature relaxing in the groove of a familiar pattern, the sudden appearance of another aircraft

or other variables which must have been available to the pilot but he did not actively attend to it. He had set up a pattern, anticipated his procedure, and "tuned out" his personal input channels. It is not uncommon to become so preoccupied with instruments or other tasks that you become oblivious to your surroundings. In addition, how often do you find yourself at a loss to account for periods of time, not day dreaming, but actual blank periods. This so called micro-sleep is apparently a complete shutting down of the brain for short rest periods, (10 milliseconds to 3 seconds), which become more frequent and of longer duration, the longer you are awake, the more you are fatigued, and the less stimulating is the environment.

Odd as it may seem there will be times when an accident would not have occurred if the overall conditions had been marginal rather than ideal. These accidents that occur under ideal conditions always have the element of "I don't see how it could have happened", they are literally "senseless" in that the humans sensory systems have been monentarily closed.

Perhaps the next approach will be in finding deliberate ways of degrading the "too perfect" situation. Several very astute psychologists have even proposed "random electrical shocks to an appropriate part of the pilots anatomy". The Navy Safety Center recently enacted a new technique for analyzing accidents using the verbal labels of Judgement, Attention, and Memory - The J. A. M. Factors. It is hoped that such analysis can lead to improvements of the aforementioned situations and thereby reduce accidents. Let us hope that these new J. A. M. factors do not become another, slightly amplified, substitute for "pilot error".

Hazards Of Dusk

The difficulties pilots experience on landing at dusk or when the sun is 5^{o} above the horizon to 18^{o} below the horizon, are perhaps not widely realized. A penetration from 20,000 ft. and above to a landing, all of which occurs from 5-10 minutes later, maneuvers the pilot from daylight to dim twilight or almost night conditions faster than dark adaptations can take place.

At sunset there is a relatively bright sky, a visible sun and a dark earth. Clouds may be bright and may be a source of illumination for the earth; however, depending on their location, they may be dark and may limit light from the sky to the earth.

Atmospheric haze is particularly significant at this time of day. The rising of dust by nature and by man, and the lifting of water from the land or by the sea during the heat of the day tend to produce maximum haze at dusk. This haze lies as a veil over the ground/sea. It is illuminated by skyshine and sunshine; when viewed from above it can drastically obscure the earth beneath. Visibility through a "standard ordinary clear atmosphere" might be considered as 20 miles. At dusk, due to atmospheric haze, visibility is reduced to a fraction of this.

Ground brightness levels depend on two sources of light. Skyshine may be the principal source and the second source is sunshine; but, at this time

of day, ground shadows result in the darkening of vast areas. The tangential direction of the sun's rays outlines projections and contours which are misleading to the uninitiated and which must be interpreted with care, even by the experienced. The rapid visual shift from altitude conditions to dusk landing conditions results in an earth depopulated of all but its most prominent objects, with almost a complete loss of any true color.

Because there is a decrease in the visible objects below, although objects on the horizon may remain, the pilot's appreciation of the space below him will be changed and may appear smaller than it is, which in-turn gives it a new more pronounced contour.

Added to all of this is a pronounced loss of visual acuity and of the visual field due to the decreased light levels that result during the descent at dusk. This in-turn causes a tendency toward space or night near-sightedness which may be significant enough to blur objects on the ground.

The pilot who makes a dusk descent and landing is faced with the facts that the eyes cannot dark adapt rapidly enough, visual field acuity and visual field size are decreased, colors are untrue, objects are distorted or missing and time and distance are working against him. He therefore should develop the wise habit of relying heavily on his instruments. Cockpit lights set for night vision will be too dim; standard daylight illumination turned down slightly would be in order. The importance and value of oxygen under these conditions should be remembered. The pilot should be prepared to accept the spatial clues of night, which are supplied by the airport lights; added detail may be perceived by turning on his own lights.

Regardless of how well one may understand these phenomena, you can not fully appreciate the degree to which your unassisted vision is decreased, or the extent to which it may present erroneous information. Instruments, landing lights, and airfield lights may be the most accurate guides and should be utilized generously.

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Leadership Concept:--Hard Versus Soft Management

The difference between the good leader, manager, or supervisor and the run-of-the-mill one is that the good leader makes things happen while the other allows things to happen. This is frequently referred to as the difference between the traditional, military or "hard" management and "soft" management. In "Hard" management, the leader knows what he wants to have happen and what needs to be done to accomplish this mission. In "soft" management the leader backs off from responsibility and merely allows things to happen. However, there is only one kind of leadership — that conduct which induces followership and aids in accomplishment of mission. It has to be adapted to the situation. On occasion it may be driving — a kick in the seat; other times it may be pulling — inquiring into and tapping a person's mental resources. Whichever it is, it requires knowledge of human behavior to promote outstanding performance.

When Business is Slow DA NANG Doctors Go

Article in 20 Dec 1963 issue of The Rotor Blade - Special Services Newsletter of the MCAF FUTEMA, MAG-16 1st MAW.

DA NANG, Republic of Vietnam -- When chores at the U. S. Marine Medical Dispensary here aren't pressing, Navy doctors and corpsmen attached to the U. S. Marine unit regularly hop in a jeep or helicopter to find ones that are.

A five-minute jeep ride takes them to a Vietnamese Army camp's dependents school where they push aside desks and chairs in the kindergarten classroom and hold clinics twice a week.

And one of the doctors, Lt. Ronald F. Swanger, Medical Corps, USN, pays a call to a thatch-roof dispensary at Nam Dong, a remote village in north-central Vietnam, when there's a Marine chopper heading that way.

Started last summer by the late Lt. Bruce Farrell, the program of medical aid to the Vietnamese has matured into one of the more valuable people-to-people projects in Vietnam's I Corps sector of counter-insurgency operations. Doctor Swanger and Lt. Thomas K. Ciesla, Medical Corps, USNR, took over the program in October, (1963).

The doctors and their dispensary's six corpsmen alternate on the Tuesday and Thursday morning visits to the school. They're helped by two Vietnamese nurses, Nguyet and Minh Phuong, and an interpreter they call "Loc."

Swanger also takes a corpsman along with him to Nam Dong. They meet SFC Adolph G. Wilson, U. S. Army Special Forces medic at nearby Tarau outpost, and with an interpreter and two nurses, drive to the village.

Progress with modern medicine among the Vietnamese has its problems. Centuries-old methods of the "witch doctor" are deep-seated in the beliefs of the Vietnamese adults. Some will see the "strange" doctor only as a last resort. "By then, it's generally too late," Swanger says.

Even when the patience and perseverance of the Marine doctors appear to have offset these beliefs, they often discover their patients still seeing the "witch doctor" and using his home "remedies." "Guess they figure if they get both kinds of treatment, they'll be that much better off," muses Sgt. Wilson about his experiences at Nam Dong.

Another headache is getting patients to follow treatments. Many have yet to gain confidence in modern medicine, either from the Americans or from reputable Vietnamese doctors. "If they don't get relief immediately, they stop taking the prescription," Swanger explains, "On the other hand, they stop if they do get relief, and often the disease hasn't been completely wiped out."

Ciesla and Swanger fight unfaithful treatment and save medicine that might otherwise be wasted by issuing only a day or two's supply. A patient must return for further doses. They give injections as much as possible "so we're positive the treatment is doing the most good," Ciesla adds.

"These people respond tremendously to antibiotics," reports Doctor Swanger. "The disease germs of many of the sick haven't been subjected to antibiotics before and so haven't built up the slightest defense against them."

Typical of what Americans encounter at clinics was Swanger's most recent at Nam Dong in late November. HM3 John W. Clark, Jr., the Doctor, and Sgt. Wilson worked four hours to treat 125 patients for tuberculosis, hook worm, dermatitis, stomach infections, vitamin deficiencies, and assorted boils and eye troubles.

Clark and Wilson used their dental training to pull a few teeth.

There was an infant girl with cellulitis, a skin infection. A "witch doctor's" potion was smeared over her head and arms. Swanger gave the child a shot of penicillin. He told the mother to wash the girl and bring her to Tarau outpost's dispensary that afternoon for a few days treatment. The mother never came.

There was an eight-year-old girl suffering from a form of psychosomatic shock since the death of her mother 20 days before. The girl couldn't walk. But she was fortunate enough to be under care. One of the most encouraging signs of progress at Nam Dong lies in villagers' plans to build a new dispensary. Twice the size of the present dirt-floor hut, it will have a waiting room, pharmacy, emergency and treatment rooms, a doctor's office, an eight-bed ward--wooden floors.

"There's a distinct difference between the people at Nam Dong and the Vietnamese dependents at the school," Swanger reports. "In the village, there were only the home remedies of 'witch doctors' until Special Forces came. Also, their standards of health and sanitation are significantly lower than those of the Da Nang military people. We can find the same diseases in both groups but those of the mountain people show a sharp contrast in symtoms and severity over their city-dwelling counterparts."

Besides Clark, the U. S. Marine Corps Dispensary's roster of corpsmen involved in clinics includes Chief Hospitalman Cecil R. Hasha; John B. Stanistreet and Anthony M. Vega, both hospitalmen second class; HM3 Richard E. Baldwin, and Hospitalman William V. Baltzer.

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What is an Aviation Physiologist?

By Lieut. Martin Passaglia, MSC, USN, Naval Medical Research Institute, NNMC, Bethesda, Md.

An Aviation Physiologist is a Naval Officer first and foremost, with all of the duties and responsibilities inherent to this honorable profession. He is a conscientious, loyal and faithful representative of the naval service, commanding respect from his subordinates and admiration from his superiors for his knowledge, ability, devotion to duty, dedication and motivation to give himself to the Navy unswervingly at all times. He must serve many masters who demand his services and abilities at their convenience: his country, the Navy, his crew, as well as his civilian contemporaries whose freedom he has sworn to uphold. All of these masters require obedience, incontestable allegiance

and a devotion to duty which on occasion must surpass his devotion to his family and friends. In essence, he is a servant with complete obeisance to the needs of his country and of the Navy. He must be imbued with this spirit throughout his entire career and these thoughts should control all of his actions and relations with those who would desire his services.

The Aviation Physiologist moreover is a representative of the Medical Service Corps, a specialist in one of the more practical aspects of aviation medicine with knowledge, competence and extensive training in those problems which fall under his aegis. As a member of the Medical Service Corps his sole function is to serve to the very limits of his capacity the needs of the Corps whose raison d'etre is service to the Fleet and the Medical Corps. The Aviation Physiologist is a supplement to the Flight Surgeon who must necessarily call upon the specialist for definitive answers to very specific queries into matters under the jurisdiction of the physiologist. The Aviation Physiologist should be aware constantly of his place and function in the Medical Department as an assistant to the Flight Surgeons. Accordingly, his knowledge should reflect his academic background, his training, his abilities and his motivation to succeed in his chosen field of endeavor. To achieve some measure of success in this field, the aviation physiologist should be erudite, articulate before all groups, and not without some ability to manipulate the various instruments and tools which are at his disposal for training and instruction. Above all he should be capable of imparting his knowledge to his assistants and to the students who come to him for instruction and qualification. Knowledge, enthusiasm, and an unselfish devotion to duty should be the creed of the Aviation Physiologist.

Throughout his career the aviation physiologist should retain an awareness of his dual-nature as a Naval Officer/Physiologist and should strive diligently to succeed in both as a good Naval Officer, his primary responsibility, and as an accomplished Aviation Physiologist in the Medical Service Corps. These two natures cannot and should not be separated and throughout his career regardless of his duty, the aviation physiologist must labor with increased devotion and efficacy to retain his unique, position. To become only academic and scholarly many jeopardize the primary stature of the physiologist as a Naval Officer with a resultant detrimental effect on the structure of the Medical Service Corps. The true aviation physiologist is a bridge spanning the area between specialization in aviation medicine and the role of a functional, energetic Naval Officer. Conscientious application of sound and well established principles of naval leadership, customs, traditions, and disciplines will assist the aviation physiologist to maintain his dual-role and successfully accomplish his mission in the Navy and service for his country.

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Immersion Hypothermia

By Captain David Minard, MC, USN (Ret), USN Medical News Letter, 29(1): 35-38, Jan. 4, 1957 (Then Cdr. MC, USN).

Acute general hypothermia resulting from immersion in sea water at temperatures below 68° F. (20° C.) is a serious hazard to survivors of ship or aircraft disasters at sea. The human body when immersed in cold water loses heat from two to four times faster than it does when in air at the same temperature. Therefore, unless the ocean temperature is 70° F. (21° C.) or above, survival following immersion is limited to a few hours in moderately cold water (50° F. - 68° F.) and may be less than half an hour in the frigid seas of the polar regions where water temperatures of from 32° F. (-2° C.) are common. For example, wartime experience showed that in water at 40° F. (4.5° C.) only 50% of the men survived longer than 1 hour. The degree of cold and the mean survival time bear a hyperbolic relationship such that the product of the two is roughly constant. This does not imply, however, that survival time can be predicted with certainty from water temperature alone. On the contrary, individual factors often determine whether a victim of immersion will survive a longer or shorter time than that predicted. Some of the more important variables determining survival time are: the amount and kind of clothing worn, the thickness and distribution of the insulating layer of subcutaneous fat, the ratio of body surface to body volume, the extent and duration of the increased heat production resulting from shivering or swimming activity, and the will to survive.

On acute exposure to cold, man like other homeotherms, possesses two important protective mechanisms to safeguard the constancy of his central or "core" temperature: first, peripheral vasoconstriction which shunts warm blood away from the body surface, thereby reducing heat loss, and second, shivering, an involuntary skeletal motor activity which can increase metabolic heat production up to five times the basal level. Diverting blood away from the body periphery increases the temperature gradient from core to surface and reduces the temperature gradient from the body surface to the cold water environment.

If heat loss is thereby brought into line with the increased heat production, thermal balance is re-established and core temperature is stabilized. This situation exists at water temperatures of 68° F. (20° C.) and above. At lower water temperatures, the rate of heat loss exceeds heat production despite vigorous shivering, and core temperature begins to fall. Shivering and also consciousness are progressively depressed as deep body temperature falls below 95° F. (35° C.). From then on, hypothermia proceeds unchecked. Lethal levels of body temperature are reached when the net heat loss from the body (calories lost minus calories produced) is in the range of 650 to 800 kilocalories (Kcal.). A net loss of 800 Kcal. in a 70-kilogram man will result in a rectal temperature of 77° F. (25° C.). Although survival has been reported in cases of accidental hypothermia with rectal temperatures lower than this, such reports are rare.

Death in hypothermia results from cardiac arrest or ventricular fibrillation. Restoring normal cardiac rhythm by electrical and manual means is now a common practice when cardiac arrhythmia or arrest occur in intentional hypothermia employed in cardiac surgery. These methods, however, are not of practical value to medical officers applying treatment to survivors at sea.*

The key element in the emergency treatment of immersion hypothermia is immediate and rapid rewarming by immersing the victim in a tub bath maintained at from 110° to 120° F. (43° - 49° C.). Second best to a hot bath is a steaming shower. Hot liquids and brandy by mouth are useful adjuvants, but are not in any sense a substitute for external heat.

The aim of rapid rewarming is to restore body heat without risking the danger of "paradoxical cooling," a phenomenon observed by James Currie in human experiments on hypothermia performed over 150 years ago and confirmed by others many times since. The term denotes a sharp further drop in deep body temperature which occurs after the victim has been removed from the cold water. In this phase, collapse and death are not infrequent, a tragic sequel to what first appeared to be a timely rescue. The explanation is as follows: During immersion, the surface tissues often referred to as the body "shell" are relatively bloodless and reach a temperature only a few degrees above that of the water. Return of the victim to a warmer air environment induces relaxation of the skin vessels. As warm blood from the core perfuses the intensely chilled tissues of the body shell, blood temperature approaches that of the tissues. The cold venous blood upon returning centrally causes the further fall in deep temperature that was noted by Currie.

Immersing the victim in a hot water bath prevents this occurrence by establishing a steep temperature gradient from outside inward, thus simultaneously heating the surface tissues and preventing heat loss from the perfusing blood. Under these conditions, core temperature begins to rise rapidly and within 15 to 20 minutes has risen to 96° F. or higher with complete restoration of function and comfort. Recovery is usually complete, although mild degrees of local injury of the immersion-foot type have been described.

Victims of prolonged exposure to mild cold experience chronic rather than acute hypothermia. Because there may be additional physiologic disturbances, such as dehydration and decreased plasma volume, the treatment differs from that described for acute hypothermia. Slow rewarming with restoration of the depleted volume of circulating blood has been recommended as the safer procedure. Chronic hypothermia of this type is not usual in immersion and is far more common in accidental cold exposure on land.

Two items of survival equipment designed to prevent immersion hypothermia in survivors of ship or plane disasters at sea are, first, the immersion suit, and second, the inflatable covered life boat. Immersion suits have been designed for aviators flying over cold areas of the ocean. When worn over dry flight clothing, this permits survival in water at 32° F. (0° C.) for a period of 4 hours and possibly longer. A suitable immersion suit for shipboard personnel has not yet been designed. Conditions aboard ship are vastly

different from those aboard a plane. Impermeable clothing cannot be worn continuously below decks or by deckhands doing heavy work in cold weather, because evaporation of body moisture is prevented and body heating results. An immersion suit which can be quickly donned before abandoning ship is an alternative solution, but further improvements in the design of such clothing are needed.

The second major item of survival equipment in cold waters is the inflatable covered lifeboat. In 1951, at Argentia Bay in Newfoundland, ten Navy volunteers wearing regulation clothing jumped from the deck of a ship into water at 37° F. (2-1/2 C.), swam to an inflated covered lifeboat, climbed aboard, and remained 5 days on survival rations without evidence of serious chilling. This equipment is now replacing outmoded life floats and life rafts which fail to prevent immersion and its consequences. A technique for the direct transfer of shipboard personnel to lifeboats without an intermediate sojourn in icy water is urgently needed.

Medical officers treating survivors can contribute to the sparse knowledge of immersion hypothermia by noting with care water temperature at the time and place of rescue, the rectal temperature of the survivor, the duration of exposure, and pertinent details regarding clothing and body habitus.

* (It is to be noted that both external cardiac massage and mouth-to-mouth artificial respiration (resuscitation) were developed and accepted as life-saving procedures since Doctor Minard's article was written in 1957; under the conditions given they should be given a faithful trial). — Editor

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RESERVE SECTION

Erratum Notice Re: Salary and Rank of Naval Interns. The information contained on page 39 of Vol. 43, No. 1, 3 January 1964 issue of the Navy Medical News Letter was partially in error. Paragraph #5 under Naval Internships (Continued) is corrected to read:

> "#5. Under present Navy Promotion policies, naval interns are initially appointed in the rank of Lieutenant. Interns with dependents receive approximately $8,375 per year; those without dependents receive approximately $8,074 per year."—Medical Corps Branch, ProfDiv, BuMed.

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Pharmacy and Materia Medica, NavPers 10999-A. This correspondence course is now available to applicants. It is outlined on page 19 of this issue of the Medical News Letter.

MSC Commander Appointed Executive Director of American Occupational Therapy Association

Commander Frances Helmig, Medical Service Corps, USNR (inactive), has accepted appointment as Executive Director of the American Occupational Therapy Association, effective 2 January 1964.

A native of Atlantic City, Miss Helmig received her AB degree from New Jersey State Teachers College in 1934 and taught in the Atlantic City Public Schools for four years following that date. Her professional education includes the certificate of the Philadelphia School of Occupational Therapy and a masters degree from the University of Southern California.

Commander Helmig's professional work experience started as Assistant Director of the Philadelphia Curative Workshop in 1941. From 1942 to 1946, she headed the occupational therapy department at the U. S. Naval Hospital in Philadelphia and, since that date, has maintained her commission in the Naval Reserve. Following the war, Miss Helmig served as Director of the Rochester Rehabilitation Center (Rochester, New York) and held consultancies with the National Society for Crippled Children and Adults and the Health and Welfare Council of Philadelphia. In 1959, she returned to clinical work, as Director of Occupational Therapy at the Emily P. Bissell Hospital in Wilmington, Delaware and since 1961 she has been Chief Occupational Therapist at New York's Institute of Physical Medicine and Rehabilitation.

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Navy Ensign 1915 Medical Program (continued)

Questions And Answers (continued)

6. While participating in the Senior Medical Student Program, may a student work as an extern?

   Yes; however, if such an arrangement is a requirement of the school where the student is enrolled any salary or remuneration accepted above and beyond the active duty pay of the student must be deposited with the Treasurer of the United States. This should not be construed to prohibit purely off duty employment if such employment does not interfere with performance of duty, i.e., medical studies, and does not reflect discredit on the naval service. Remuneration received from such off duty employment may be retained by the participant.

7. May Ensign 1915 officers become members of Naval Reserve paid drilling units?

   No. Membership in a paid drilling unit requires that the individual

be a "Ready" Reservist, and "Ready" Reservists comprise a group which would be called during the early part of a war or national emergency. Since medical students are not eligible for this type of active military service until after completion of medical studies and internship, they are ineligible to affiliate with paid drilling units of the Naval Reserve. Participation in vacation training sponsored by the Navy is emphasized as the approved training with pay for the Ensign 1915.

8. If a medical student accepts a commission as Ensign 1915 USNR, will he receive the 15 gratuitous retirement points for each year of participation ? If not, is there any way in which an Ensign 1915 may earn retirement points while in medical school?

Yes, providing he earns a minimum of 35 retirement credits during each year that he is an Ensign 1915 USNR. Ensigns 1915 may earn retirement points by participation in the summer training programs, completion of correspondence courses, and attendance at regularly scheduled drills of nonpay reserve units. Students enrolled in the Senior Medical Student Program earn 1 retirement point for each day of active duty served.

(To be continued)

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